IDENTIFYING JUVENILES OF SIMILAR SPIDER SPECIES (ARANEAE)[1]

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ABSTRACT: A technique using tarsal claw characteristics was developed and used to separate juveniles of similar spider species. Differences in shape, number and arrangement of teeth on claws were useful in distinguishing the early instars of two species pairs as well as damaged specimens of a number of additional species. The ability to separate juveniles allows for a more complete study of each population.

The identification of similar juvenile spiders has been problematic in studies of spider assemblages, often resulting in a category labeled juveniles (all species combined). This approach precludes any detailed consideration of populations within a given community. Toft (1983) recognized this problem in studies of European spider assemblages pointing out that while there is an adequate descriptive base for identification of adult European spiders, there remains a poor knowledge of juvenile specimens. Using color patterns of the abdomen and cephalothorax, Toft (1983) was able to separate the stages of three species of *Meta* (Araneidae) and suggested that careful studies of other problematic groups could lead to their separation as well.

Problems which arise in separating congeneric species involve similarities in shape, size, and color as well as common familiar and generic characteristics such as eye patterns and setation. Similar problems may also arise in separating confamilial species, particularly within the diverse family Linyphiidae where closely related genera are separated largely on the basis of adult characters. Typically, the characters of the early instars are most similar, while those of later instars progress toward those of the adult forms.

In an effort to avoid these problems, a technique using tarsal claw tooth number and shape was developed and used to sort juveniles of a congeneric and a confamilial species pair collected during a study of the spider assemblages of two brackish marsh habitats (LaSalle and de la Cruz, 1985). The clubionid spiders *Clubiona maritima* L. Koch and *Clubiona saltitans* Emerton (Clubionidae) are easily separated as adults based on size and relative proportions. Juvenile stages of similar size, however, have a similar shape, color and eye pattern. The linyphiid spiders *Floricomus* sp. and *Eperigone serrata* Ivie and Barrows (Linyphiidae) are distinct in shape and color as adults. However, early stages of both species are pale with

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similar eye patterns. After examination of several characters (eye pattern, leg setation, coloration, etc.) of adult and juvenile specimens of the species in question, I determined tarsal-claw characters to be species specific and therefore useful in separating species.

Observations of tarsal-claw characters require the removal and mounting on slides of the leg-tarsus (with claws) for viewing in a compound microscope. Temporary mounts are easily prepared using glycerine as a mounting medium. Moderate pressure is generally required to spread and flatten the claws for adequate viewing. Specimens used in this study were chosen from adult-juvenile associations, either from females collected with egg sacs (*C. maritima*) or individual field collections having a range of juveniles of a single species. Additional field-collected early-stage specimens of *C. maritima* were examined to compare with egg-sac collections. In the case of *Clubiona* spp., 2nd-stage spiderlings emerge from the egg sac as evidenced by the presence of cast 1st-stage exuviae within the empty egg sac.

Clubionid spiders have two, subequal tarsal claws. In the case of both species of *Clubiona* a combination of number (Table 1) of claw teeth on either the prolateral (larger) or retrolateral claw was necessary to distinguish between early-stage juveniles. Observations were made on all four legs of adult and penultimate male and female as well as 2nd-stage specimens. The number of claw teeth varied less on leg I and II of 2nd-stage juveniles of both species (Table 1). For convenience, the number of teeth on leg I was subsequently used to make identifications. Differences in the number of claw teeth between species were consistent for all stages except males (Table 1).

Adult males of both species had more and longer teeth than other stages. Additional within-species variation involved differences between 2nd-stage spiders and other stages. There was no difference, however, between penultimate male and female spiders for either species. All but a few (2-3%) juveniles of both species were distinguishable using these characters. Questionable specimens were either assigned to a species on the basis of association with known species in the sample or by making a "best guess" decision.

Linyphiid spiders have three tarsal claws, two subequal pro- and retrolateral claws and a small median claw. In the case of *Floricomus* sp. and *E. serrata,* the shape of the first tooth of the median claw (pointed versus blade-shaped) on leg I was determined to be sufficient to distinguish early-stage juveniles (Fig. 1). Differences were also noted in the shape and size of the teeth on the two large claws; however, these were not always readily apparent unless the claws were adequately flattened on the slide. The number of teeth on the large claws also increased from early to late

Table 1. Modal values (range) of claw teeth on prolateral and retrolateral tarsal claws of all legs of 2nd-stage and leg I of penultimate (P) and adult *Clubiona maritima* and *Clubiona saltitans*.

Stage	Leg	*C. maritima* claw			*C. saltitans* claw		
		Prolateral	Retrolateral	N	Prolateral	Retrolateral	N
2nd	I	10 (9-11)[ab]	7(5-8)[ab]	20	8 (7-9)	6 (5-7)[b]	11
	II	10 (9-11)[a]	7(6-8)[a]		8 (7-8)	5.5*(5-7)	
	III	9 (8-11)[a]	7(6-8)[a]		7 (5-9)	5 (3-6)	
	IV	10 (9-13)[a]	6 (4-9)[a]		10 (8-11)	4 (2-8)	
P♀	I	10 (10-12)[a]	5.5*(4-6)	5	9 (8-9)	5 (5-6)	5
♀	I	11 (10-13)[a]	6 (5-6)	5	9 (8-9)	5 (5-6)	5
P♂	I	11 (10-12)[a]	6 (5-7)	5	8 (8-10)	5 (5-6)	5
♂	I	13.5*(13-16)[b]	9 (9-10)[b]	4	11 (10-12)[b]	8 (8-9)[b]	5

a - mean values were significantly different between species (Mann-Whitney, $P < 0.05$)

b - mean values were significantly different from all other conspecific stages (Kruskal-Wallis, $P < 0.05$)

* - modal value calculated as the average of two equally frequent values

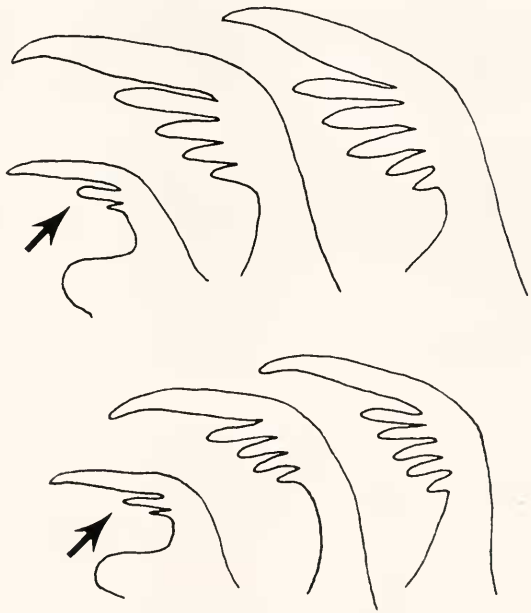

Figure 1. Tarsal claws of juvenile *Eperigone serrata* (top) and *Floricomus* sp. (bottom). Arrows point to teeth on median claws used to identify species.

stages. Oil immersion was often necessary to view the claws of small specimens. As with *Clubiona,* the identities of only a few (1-2%) juvenile specimens were questionable and were treated as previously described.

In addition to identifying similar species, I was also able to identify damaged specimens using this technique. Species from a number of families were readily identifiable using species-specific claw characters. Although the technique is somewhat time consuming, the benefit of obtaining specific identification of each specimen far outweighs the additional effort. Once the investigator becomes familiar with the characters and has mastered the preparation, each specimen in question can be identified in 3-4 minutes.

The use of claw characters as a means of identifying juvenile spiders apparently has application within a given spider assemblage. However, since characters may vary between geographically separate populations, species-specific characters should be determined for each study. As shown here, some characters may be readily apparent while others may require more careful study. Toft (1983) also pointed to the need for careful examination within a given habitat either through breeding of known species or through extensive collections and associations from confined areas.

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LITERATURE CITED

LaSalle, M.W. and A.A. de la Cruz. 1985. Seasonal abundance and diversity of spiders in two intertidal marsh plant communities. Estuaries 8:381-393.

Toft, S. 1983. On identifying juvenile spiders: some general considerations and an example (Genus *Meta*) (Arachnida: Araneae). Verh. naturwiss. Ver Hamburg. 26:211-216.